



Patent Office  
Canberra

REC'D 13 FEB 2003	
WIPO	PCT

I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PS 1717 for a patent by TROY CLUTTON as filed on 16 April 2002.



WITNESS my hand this  
Third day of February 2003

*J. Billingsley*

JULIE BILLINGSLEY  
TEAM LEADER EXAMINATION  
SUPPORT AND SALES

**PRIORITY  
DOCUMENT**  
SUBMITTED OR TRANSMITTED IN  
COMPLIANCE WITH RULE 17.1(a) OR (b)

**AUSTRALIA**

**PATENTS ACT 1990**

**PROVISIONAL SPECIFICATION**

***FOR THE INVENTION ENTITLED:-***

**"A FIN ASSEMBLY"**

The invention is described in the following statement:-

The present invention relates to a fin and in particular to a fin assembly.

The invention has been developed primarily for use with surf craft such as surfboards and will be described hereinafter with reference to that application. However, the invention is not limited to that particular field of use and is also applicable to other  
5 surf craft including surf skis and bogie boards and to water craft including kayaks, canoes, boats, sailboards and the like.

Known fins for surfboards have only incrementally advanced in the last forty years notwithstanding the reduction in size of boards and the use of modern manufacturing materials and techniques. An early style fin was used with the Malabo board, while more  
10 recent boards typically make use of a fin known as the Simon Andersen fin. The latter was introduced in the 1980's and was developed into a triple fin arrangement that was disposed at the rear of the board. The centre one of the three fins included symmetric faces and was mounted along the centre line of the board. The other two fins included asymmetric faces and were mounted at an acute angle to the centre line adjacent to but forward of the centre  
15 fin. This arrangement was reputed to provide the "Three Fin Thrust".

While the triple fin arrangement has significant advantages over the Malabo fin, it also has substantial limitations, such as increased drag and reduced manoeuvrability.

Another innovation was the Ben Lexcen fin as designed for surf craft after its success with yachts and the Australian victory in the America's Cup of 1980. This fin  
20 design was the most radical deviation from the standard fin design known to date. However, as presently understood, it has enjoyed neither significant commercial success nor acceptance within the surfing community.

Fins are now modular and generally bought separately to a board. While this allows for fin design to occur separately from that of the board, there is scant evidence  
25 that this is the case.

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

It is an object of the present invention to ameliorate one or more of the deficiencies  
30 of the prior art or at least to provide a useful alternative.

According to a first aspect of the invention there is provided a fin assembly for a surf craft, the assembly including:

a base for mounting the assembly to the surf craft;

a primary fin extending from the base and having a leading primary edge and a trailing primary edge; and

a secondary fin extending from the base and having a leading secondary edge and a trailing secondary edge.

5 Preferably, the base and the fins are integrally formed.

Preferably also, the leading edges of the fins are aligned. More preferably, the leading and the trailing edges are aligned. Even more preferably, the base extends longitudinally between the leading primary edge and the trailing secondary edge.

10 In a preferred form, the trailing primary edge and the leading secondary edge are joined by an intermediate arcuate edge defined by the base. More preferably, the arcuate edge is of varying radius.

Preferably, the leading fin extends along a first plane that is normal to the base. More preferably, both the leading and trailing fins extend along the first plane.

15 Preferably also, the fins include respective pairs of opposite faces that extend between the leading and trailing edges. More preferably, one or more of the faces are substantially planar. In other embodiments, however, one or more of the faces are substantially arcuate.

In a preferred form, fins are longitudinally spaced apart. In some embodiments, the fins are transversely spaced apart.

20 According to a second aspect of the invention there is provided a fin assembly including:

a base for mounting the assembly to an object;

a primary fin extending from the base and having a leading primary edge and a trailing primary edge;

25 a secondary fin extending rearwardly from the base and having a leading secondary edge and a trailing secondary edge.

Preferably the leading primary edge is curved substantially complementarily to the leading secondary edge.

30 According to a third aspect of the invention there is provided a fin assembly including:

a base for mounting the assembly to an object;

a first fin extending from the base and having a leading primary edge and a trailing primary edge, the fin having a high rake;

a second fin that is smaller than the first fin, the second fin extending rearwardly from the base and having a leading secondary edge and a trailing secondary edge.

Preferably, the edges extend along a single plane. More preferably, second fin is, in use, deformable in a direction normal to the plane.

5 According to a fourth aspect of the invention there is provided a fin assembly for a surf craft, the assembly including:

a base for mounting the assembly to the surf craft;

a fin that extends from the base and which has a leading edge and a trailing edge that meet at a tip, wherein the edges are coplanar; and

10 a lobe extending rearwardly from the base, the lobe having a lobe edge that extends from the trailing edge, the lobe edge including a convex portion.

Preferably, the lobe edge is entirely convex. In other embodiments, the lobe edge includes a straight portion that extends between the trailing edge and the convex portion.

15 According to a fifth aspect of the invention there is provided a fin assembly for a surf craft, the assembly including:

a base having a substantially planar surface for mounting the assembly to the surf craft;

a fin that extends from the base and which has a leading edge and a trailing edge that meet at a tip; and

20 a lobe extending rearwardly from the base, the lobe having a lobe edge that has a tangent that is parallel to the surface.

Preferably, the base, the fin and the lobe are integrally formed. More preferably, the base and the lobe extend longitudinally. Even more preferably, the base extends longitudinally between the leading edge and the trailing edge.

25 Preferably also, the lobe is directly underlying the leading and the trailing edge. More preferably, the lobe, the trailing edge and the leading edge extend in a common plane. Preferably also, the trailing edge is feathered in an area intermediate of the lobe and the leading edge.

30 In a preferred form, the trailing edge and the lobe are joined by an intermediate arcuate edge defined by the base. More preferably, the arcuate edge is of varying radius.

Preferably, the fin extends along a first plane that is normal to the base.

Preferably also, the fin includes a pair of opposite faces that extend between the leading and the trailing edge. More preferably, one or both of the faces are substantially planar. In other embodiments, however, one or both of the faces are substantially arcuate.

Preferably, the edges extend along a common plane.

5 In a preferred form, the lobe includes a leading secondary edge and a trailing secondary edge. More preferably, the lobe is a secondary fin.

According to a sixth aspect of the invention there is provided a fin assembly including:

a base for mounting the assembly to an object; and

10 a fin extending from the base and having a leading edge and a trailing edge and a high rake.

According to a seventh aspect of the invention there is provided a fin assembly for a surf craft, the assembly including:

a base for mounting the assembly to a substantially planar surface of the surf craft;

15 a fin that extends from the base and which has a leading edge and a trailing edge that meet at a tip, wherein at least part of the trailing edge underlies the leading edge; and

a lobe extending rearwardly from the base, the lobe having a lobe edge that extends from the trailing edge, the lobe edge including a tangent that is parallel to the surface.

Preferably, the assembly has a height and a transverse cross sectional area, wherein  
20 that area is substantially the same as the transverse cross sectional area of a prior art assembly of the same height. That is, the assembly of this aspect has a different transverse cross sectional shape from the prior art, in that the base is more elongate and the extent that the trailing edge underlies the leading edge is greater. An alternative manner of expressing the extent that the trailing edge underlies the leading edge is in  
25 terms of the rear cut-away of the fin. Accordingly, in the preferred embodiments, the rear cut-away of the fins is greater than would be the case for the prior art fins of same height.

According to an eighth aspect of the invention there is provided a method of manufacturing a fin assembly for a surf craft, the method including:

30 providing a base for mounting the assembly to the surf craft;

forming a primary fin that extends from the base and which has a leading primary edge and a trailing primary edge; and

forming a secondary fin that extends from the base and having a leading secondary edge and a trailing secondary edge.

Preferably, the base and the fins are integrally formed.

According to a ninth aspect of the invention there is provided a method of  
5 manufacturing a fin assembly, the method including:

providing a base for mounting the assembly to an object;

forming a primary fin that extends from the base and which has a leading primary edge and a trailing primary edge;

forming a secondary fin that extends rearwardly from the base and which has a  
10 leading secondary edge and a trailing secondary edge.

According to a tenth aspect of the invention there is provided a method of manufacturing a fin assembly, the method including:

providing a base for mounting the assembly to an object;

forming a first fin that extends from the base and which has a leading primary edge  
15 and a trailing primary edge, wherein the fin has a high rake;

forming a second fin that is smaller than the first fin, the second fin extending rearwardly from the base and having a leading secondary edge and a trailing secondary edge.

According to an eleventh aspect of the invention there is provided a method of  
20 manufacturing a fin assembly for a surf craft, the method including:

providing a base for mounting the assembly to the surf craft;

forming a fin that extends from the base and which has a leading edge and a trailing edge that meet at a tip, wherein the edges are coplanar; and

forming a lobe that extends rearwardly from the base, the lobe having a lobe edge  
25 that extends from the trailing edge, the lobe edge including a convex portion.

According to a twelfth aspect of the invention there is provided a method of manufacturing a fin assembly for a surf craft, the method including:

providing a base having a substantially planar surface for mounting the assembly to the surf craft;

30 forming a fin that extends from the base and which has a leading edge and a trailing edge that meet at a tip; and

forming a lobe that extends rearwardly from the base, the lobe having a lobe edge that has a tangent that is parallel to the surface.

According to a thirteenth aspect of the invention there is provided a method of manufacturing a fin assembly including:

providing a base for mounting the assembly to an object; and  
forming a fin extending from the base and having a leading edge and a trailing edge  
5 and a high rake.

According to a fourteenth aspect of the invention there is provided a method of manufacturing a fin assembly for a surf craft, the method including:

providing a base for mounting the assembly to a substantially planar surface of the surf craft;  
10 forming a fin that extends from the base and which has a leading edge and a trailing edge that meet at a tip, wherein at least part of the trailing edge underlies the leading edge; and  
forming a lobe extending rearwardly from the base, the lobe having a lobe edge that extends from the trailing edge, the lobe edge including a tangent that is parallel to the  
15 surface.

Preferred embodiments of the invention will now be described, by way of examples only, with reference to the accompanying drawings in which:

Figure 1 is a side view of a fin assembly according to a first embodiment of the invention;

20 Figure 2 is a side view of a fin assembly according to a second embodiment;

Figure 3 is a side view of a fin assembly according to a third embodiment;

Figure 4 is a rear view of the fin assembly of Figure 1; and

Figure 5 is an inverted plan view of a fin assembly according to a fourth embodiment.

25 Figure 6 is a side view of a fin assembly according to a fifth embodiment of the present invention;

Figure 7 is a side view of a fin assembly according to a sixth embodiment;

Figure 8 is a rear view of the fin assembly of Figure 6;

Figure 9 is an inverted plan view of the fin assembly of Figure 6; and

30 Figure 10 is a diagrammatic side view of the fin assembly according to Figure 6 illustrating various characterisations of the assembly.

Referring to Figure 1, there is illustrated an integrally formed fibreglass fin assembly 1 including a base 2 for mounting the assembly to an object in the form of a surfboard 3. A

primary fin 4 extends from base 2 and has a compound arcuate leading primary edge 5 and a compound arcuate trailing primary edge 6. A secondary fin 7 extends rearwardly from base 2 and has a compound arcuate leading secondary edge 8 and a compound arcuate trailing secondary edge 9. The arcuate form of the leading primary edge 5 and leading secondary edge 8 are substantially complementary.

Base 2 and fins 4 and 7 are integrally formed and the leading edges of the fins are aligned. Moreover, the base extends longitudinally between edges 4 and 7.

Edges 5 and 6 intersect to define a primary fin tip 10, while edges 8 and 9 intersect to define a secondary fin tip 11. Tip 10 is an inflection point of edges 5 and 6, while tip 11 is an inflection point of edges 8 and 9.

Tip 10 is more proximal to base 2 than the portion of edge 5 that is immediately adjacent to tip 10. That is, edge 5 over wraps the adjacent portion of edge 6. This is an example of feathering of edge 6.

Edge 6 and edge 8 are joined by an intermediate arcuate edge 13 that is defined by base 2. Edge 13 is of varying radius.

In this embodiment, the fins are longitudinally spaced apart. However, in other embodiments, the fins are transversely spaced apart.

Each fin 4 and 7 includes respective pairs of opposite faces 15 and 16 that extend between the respective leading and trailing edges. In this embodiment, all of faces 15 and 16 are non-planar. However, in other embodiments, one of each face 15 and 16 is substantially planar. More preferably, the planar faces are on corresponding sides of the respective fins. In still further embodiments, all faces 15 and 16 are substantially planar. It will be appreciated from the teaching herein that other combinations are available.

Preferably, any non-planar faces are substantially arcuate.

As best shown in Figure 4, fin 4 extends along a plane 20 that is normal to base 3. Accordingly, when the base is attached to the underside of a surf craft, fin 4 is also normal to and extends away from that underside. Fin 7 also extends along plane 20 and parallel to fin 4. However, in other embodiments, fin 7 extends other than along plane 20. For example, reference is now made to Figure 5 that illustrates a fin 21 according to another preferred embodiment of the invention, where corresponding reference numerals denotes corresponding features. In this embodiment, fin 7 extends along a plane 22 that is parallel to but spaced apart from plane 20.

In this embodiment, the fin assembly is produced separately from, and later attached to a surf craft by any suitable means.

Reference is now made to Figure 6, where there is illustrated an alternative embodiment of the invention. More particularly, an integrally formed fiberglass fin assembly 31 includes a base 32 for mounting the assembly to an object in the form of a surfboard 33. A fin 34 extends from base 32 and has an arcuate leading edge 35 and an arcuate trailing edge 36. A lobe 37 extends rearwardly from base 32 and underlies both edge 35 and edge 36.

10 In this embodiment, base 32 extends longitudinally between edges 35 and 36 and is co-planar with lobe 37.

Edges 35 and 36 intersect at an inflection point to define a fin tip 38. Tip 38 is more proximal to base 32 than the portion of edge 35 that is immediately adjacent to tip 38. That is, edge 35 over wraps the adjacent portion of edge 36. This results in edge 36 being feathered in an area intermediate lobe 37 and edge 35.

15 Edge 36 and lobe 37 are joined by an intermediate arcuate edge 39 that is defined by base 32. Edge 39 is continuous and of varying radius. Lobe 37 includes an edge 40 continuing from trailing edge 36 and intermediate arcuate edge 39. Edge 40 includes a region parallel to, or receding from, the plane that is normal to the longest axis of the fin assembly and most opposed to the fin tip 38.

20 In this embodiment, the fin 34 and lobe 37 share a common plane with base 32. However, in other embodiments, fin 34 and lobe 37 extend along respective planes that intersect.

As best illustrated in Figure 8, fin 34 includes a pair of opposite arcuate faces 41 and 42 that extend between the edges 35 and 36. However, in other embodiments, each face 41 and 42 is substantially planar. It will be appreciated from the teaching herein that other combinations are available. For example, an assembly having one face that is planar and another face that is non-planar. Preferably, any non-planar faces are substantially arcuate.

30 Fin 34 extends along a plane 20 that also extends through base 32. Accordingly, when assembly 31 is mounted to the surface of surfboard 33, fin 34 is substantially normal to and extends away from that underside.

Lobe 37 also extends along plane 20 although, in other embodiments, lobe 37 extends other than along plane 20. An example is illustrated in Figure 9 where

corresponding features are denoted by corresponding reference numerals. Particularly, lobe 37 extends along a plane 22 that is inclined with respect to and which intersects with plane 20.

In this embodiment, the fin assembly is produced separately from, and later  
5 attached to surfboard 33 by any suitable means.

The preferred embodiments have been developed to provide surf craft with an increased degree of manoeuvrability. This, in turn, enables the surfer to perform turns on the wave while maintaining proper momentum when progressing down the face of the wave. Turns are achieved by applying weight and/or pressure to the board at various  
10 locations so as to cause the edges and surfaces of the board to attack the water surface at different angles producing turning forces. The fins of the preferred embodiments improve the board's turning ability without unduly affecting forward speed through the water. In some embodiments the forward speed is increased.

The reasons for the improvement in performance of the fin assemblies of the  
15 preferred embodiments are presently understood to arise from the ability of those embodiments to allow the rake of the primary fin to be increased beyond what would be acceptable for a prior art fin while also providing an increased base length.

A fin assembly 51 is illustrated in Figure 10 to assist the addressee understand some terminology to the embodiments of the invention described in this specification.  
20 Assembly 51 is to be mounted to a surf craft 52 having a substantially planar hull that extends longitudinally between a foremost point 53 and a rearmost point 54. The longitudinal distance between these points defines the length of assembly 51. While it is usual for assembly 51 to include mounting formations that extend into the hull, these are neither shown nor relevant to the following terms.

25 Assembly 51 includes a base 55, a fin 56 that extends upwardly from the base and which has a leading edge 57 and a trailing edge 58 that meet at a tip 59. Base 55 is defined by the area bounded by two broken lines 60 and 61, hull 52 and leading edge 57. Lines 60 and 61 meet at a point 62 that is the forward most point of trailing edge 58.

Fin 56 extends from base 55 and defines a point 64 that is furthest from hull 52.  
30 The distance between the hull and point is referred to as depth.

Rake relates to the rear overhang of the fin beyond base 55. Base 55 includes a rearmost point 65 that is defined by the intersection of line 60 with hull 52. The rake for a single fin or primary fin is determined by drawing a radial line 66 of indefinite length

from the rearmost point 65 of base 55 that intersects the fin at only a single point 67. The rake is then defined as an angle 68 that exists between line 66 and hull 52. In this specification the convention has been adopted that angle 68 is forward of line 66. However, it is also known to define rake as being rearward of line 66.

5        Rake creates drag and holding power through the second half of the turn. Therefore, high rake refers to an angle of 130 degrees or greater. In the preferred embodiments there are rake angles of 140 degrees, 145 degrees, 148 degrees, 150 degrees and 154 degrees.

10        In the embodiments of the invention, while the base itself is of the same length as prior art bases, the longitudinal extent of the assembly is increased due to the rearward extent of the secondary fin or lobe. This configuration also has a greater undercut of the primary fin. The configuration of the secondary fin provides additional stability in use. Likewise, in another embodiment the rake of the fin is increased as well as the effective base length by adding the lobe. The base length is increased, notwithstanding the greater  
15        undercut of the fin, due to the rearward extent of the lobe. The configuration of the lobe provides additional stability in use.

Surprisingly, and unlike prior art fins, the manoeuvrability of the preferred  
embodiments are not compromised by the increased base length. This is due to the greater rake or undercut of the primary fin. That is, the combination of features offered by the  
20        preferred embodiments provide improved grip and hold against the water, (at the wave face and at the trough), greater ease of manoeuvrability and a substantial improvement in speed. In colloquial terms, the fin assembly provides greater drive due to the ability to trap more water.

While not wishing to be bound by theory, it is thought that the improved  
25        performance is also due, at least in part, to the emphasised curvature toward the fin tips of the longitudinally viewed fin profiles.

Assembly 1 includes a sectional area, when viewed from the side of the fin, that is substantially equivalent to the corresponding sectional area provided by a prior art Three Fin arrangement. However, the area provided by assembly 1 is distributed far differently  
30        than that of the prior art, in that fin 4 is undercut to a greater extent, and fin 7 extends rearwardly. Likewise, in the alternative embodiment, the area provided by assembly 31 is distributed by having fin 34 undercut to a greater extent, and lobe 37 extending rearwardly.

As the primary fin has a sectional area that is substantially less than a prior art fin, it allows the surfer to perform smaller radius turns. This then allows the surfer to carve the wave face with a greater frequency. However, the directional stability is not degraded due to the presence of the secondary fin, nor alternatively, due to the presence of the lobe.

5       The secondary fin, in some embodiments, is designed to flex slightly in a direction normal to the plane of the fin. This provides for additional acceleration out of turns.

The assemblies of the preferred embodiments have a height and a transverse cross sectional area, wherein that area is substantially the same as the transverse cross sectional area of a prior art assembly of the same height. That is, the assemblies of the preferred  
10       embodiments have a different transverse cross sectional shape, in that:

1. The base is more elongate; and

2. The extent that the trailing edge underlies the leading edge is greater. That is, there is a greater cut-away at the rear of the fin.

This redistribution of cross sectional area provides the benefits referred to above.

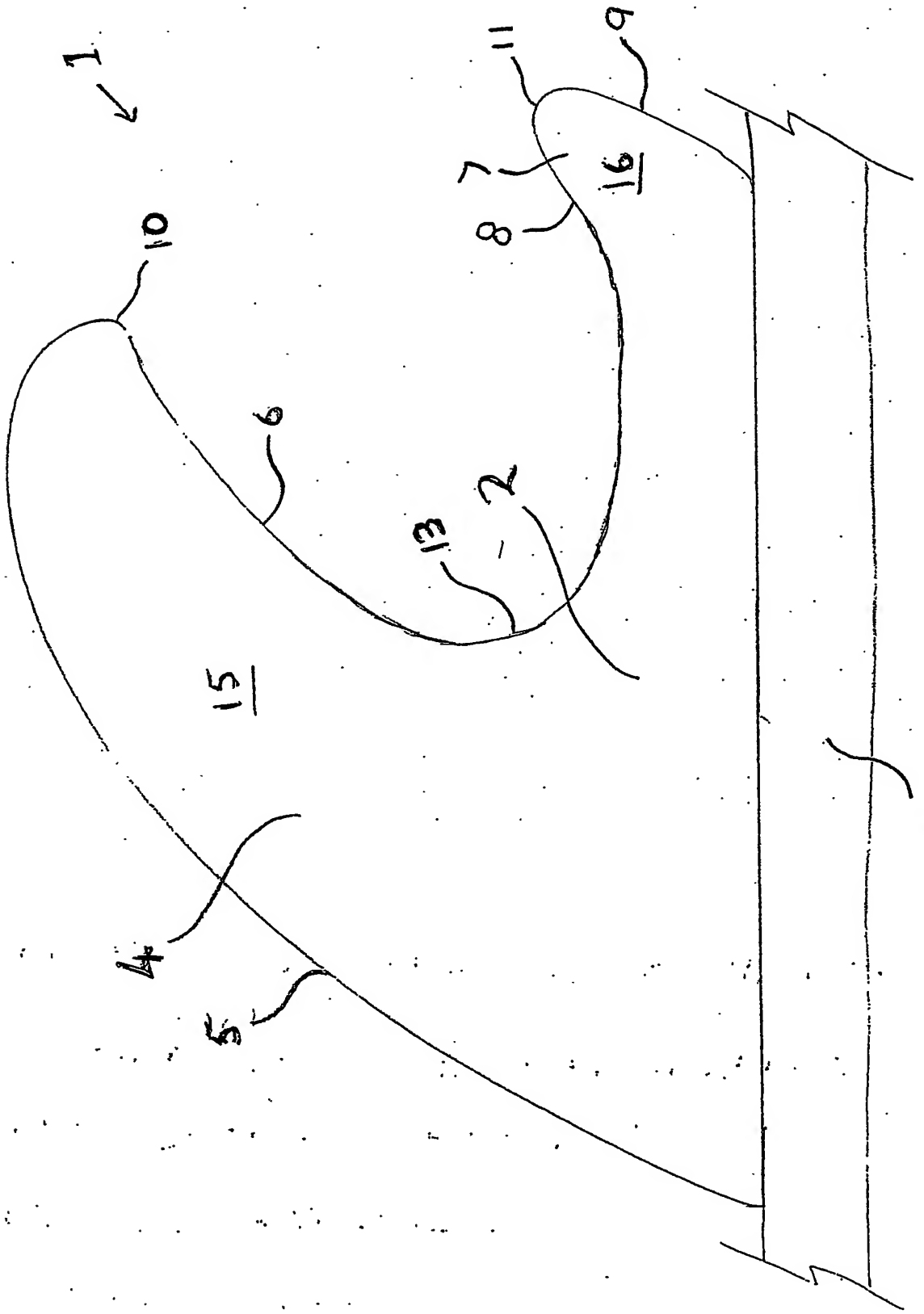
15       In some embodiments, use is made of a single fin assembly that is centrally mounted to the rear of a surfboard. However, in other embodiments, three fin assemblies are used in the prior art Three Fin Thrust configuration. Moreover, the fin assembly of the invention is scalable to other water and surf craft.

20       Although the invention has been described with reference to specific examples, it will be appreciated to those skilled in the art that the invention may be embodied in many other forms.

DATED THIS 15<sup>th</sup> day of April 2002

TROY CLUTTON

25                               Attorney: JOHN B. REDFERN  
Fellow Institute of Patent and Trade Mark Attorneys of Australia  
of BALDWIN SHELSTON WATERS



(2)

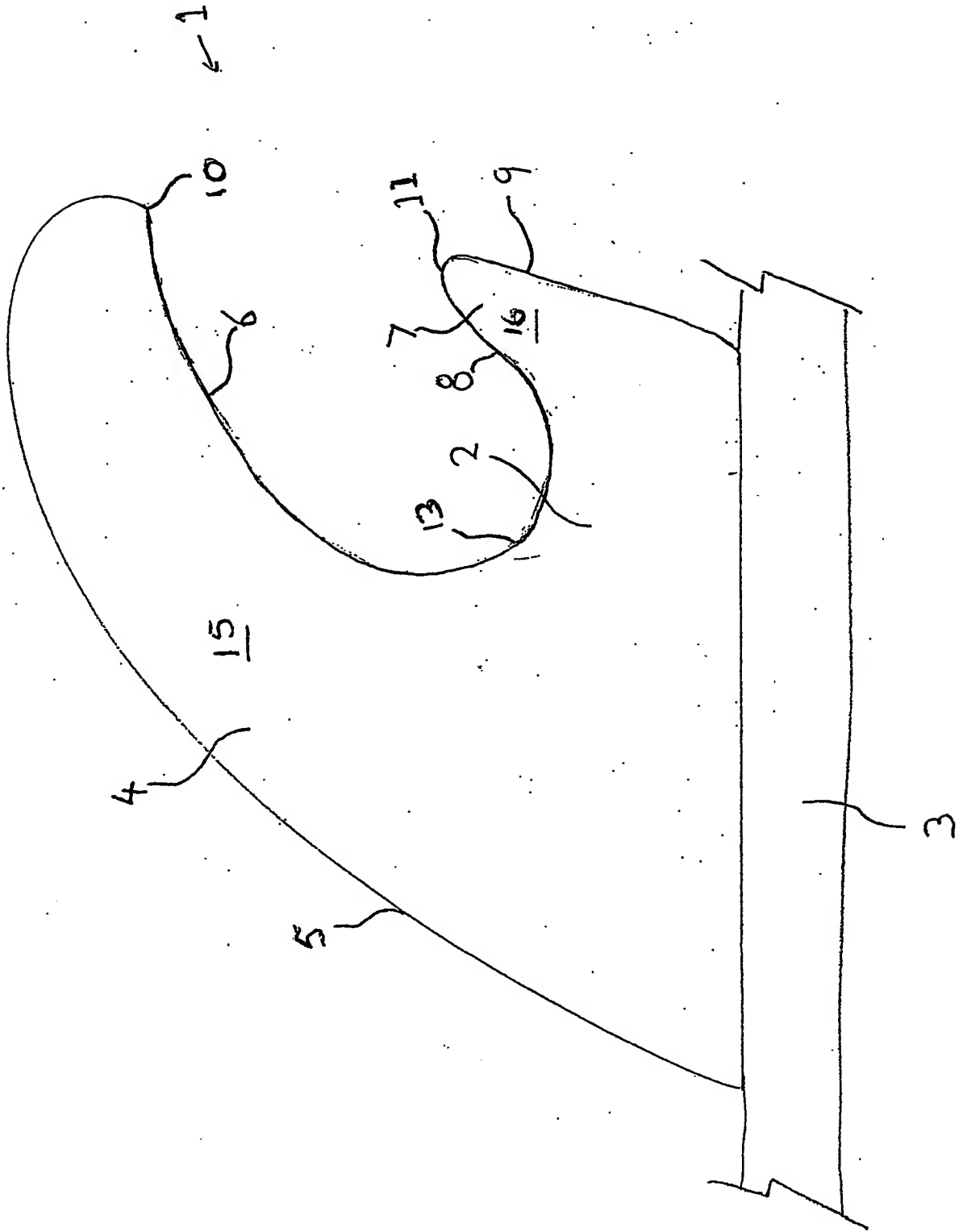


Fig 2

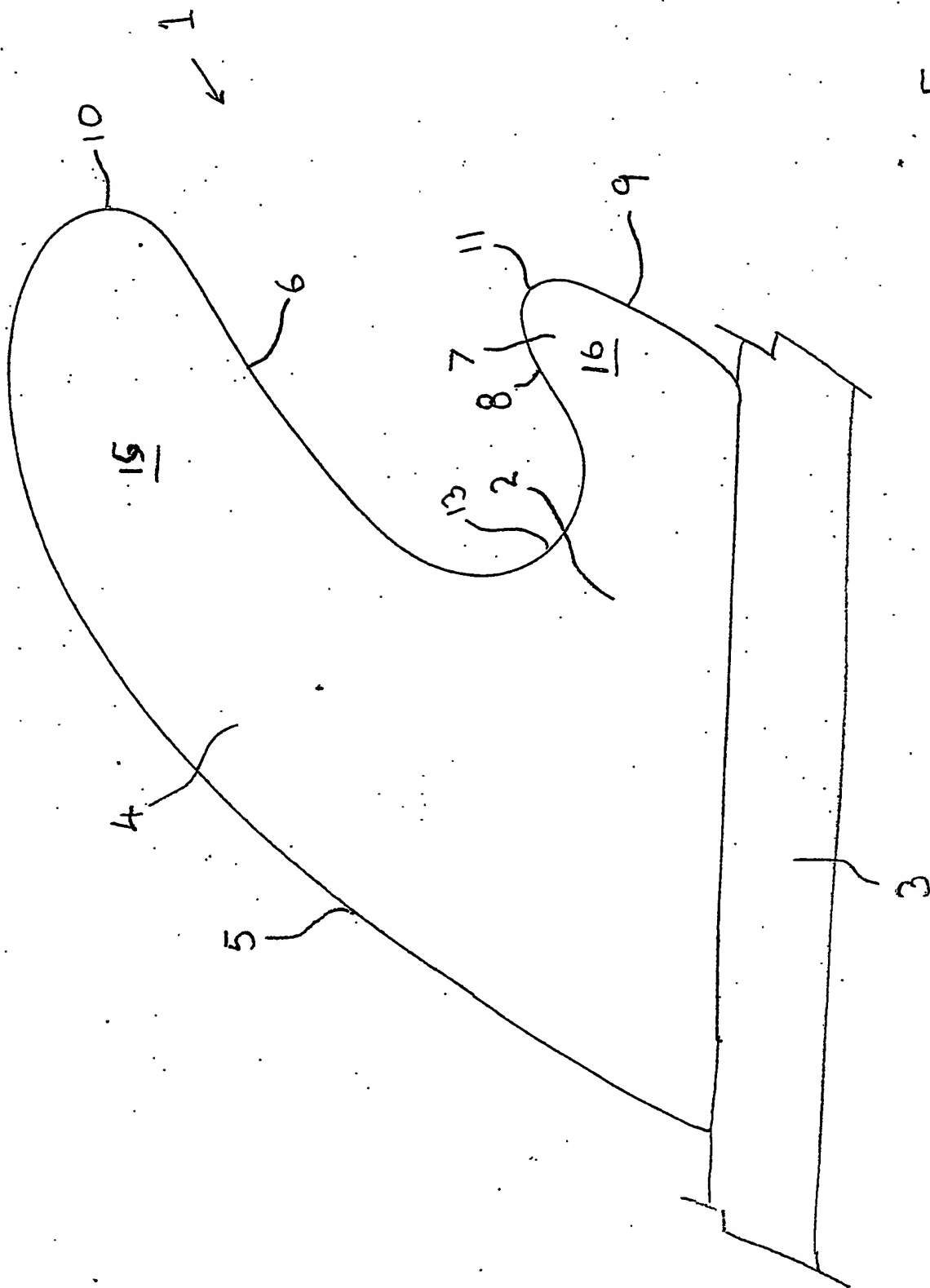
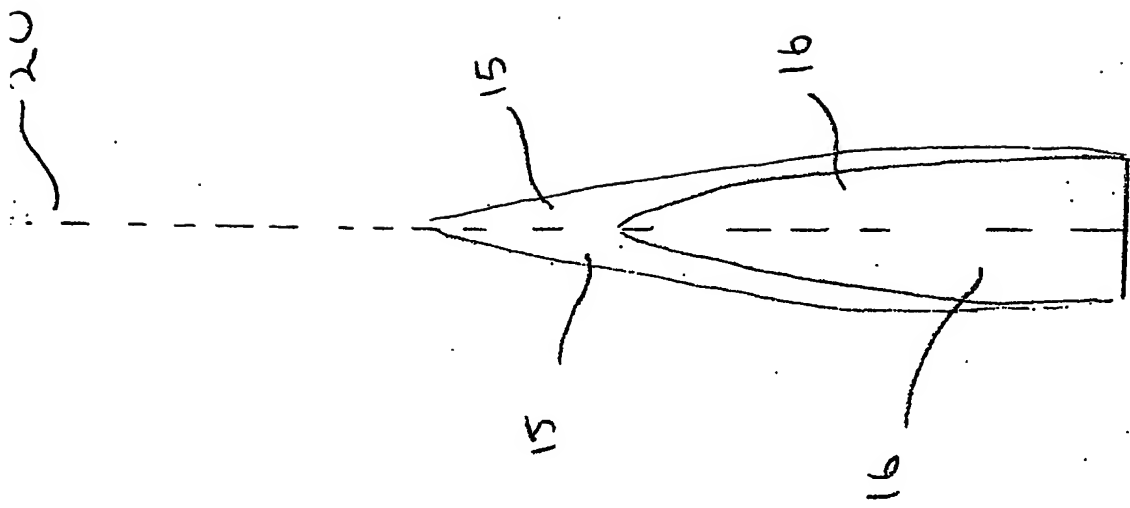


FIG 3

FIG. 4



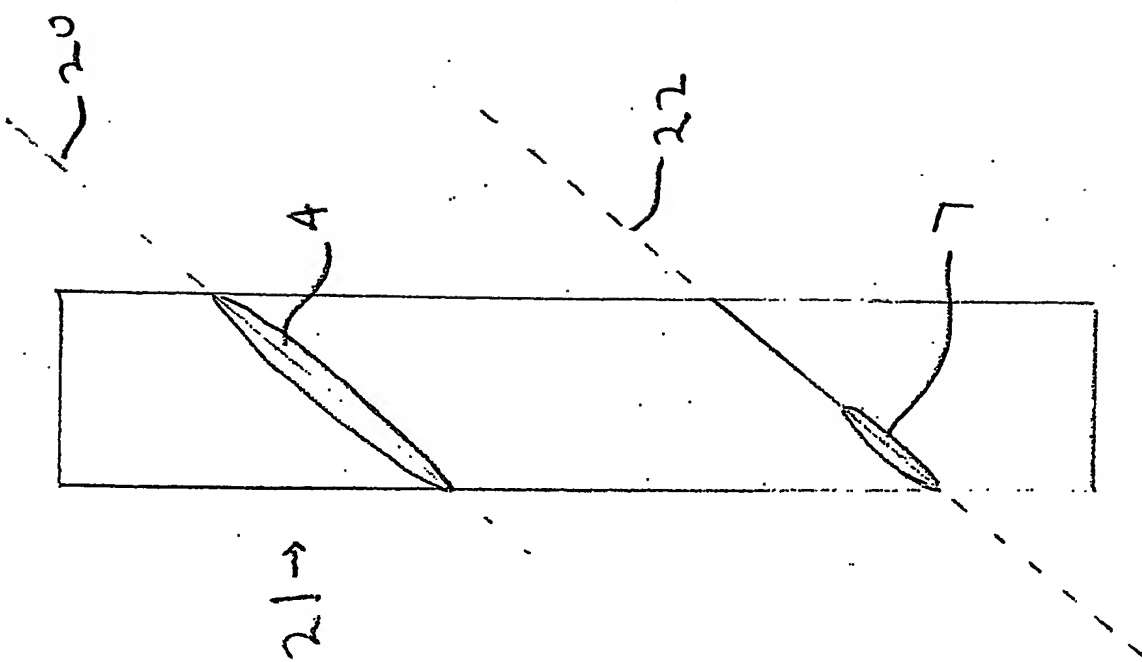


FIG 5



BEST AVAILABLE COPY

38

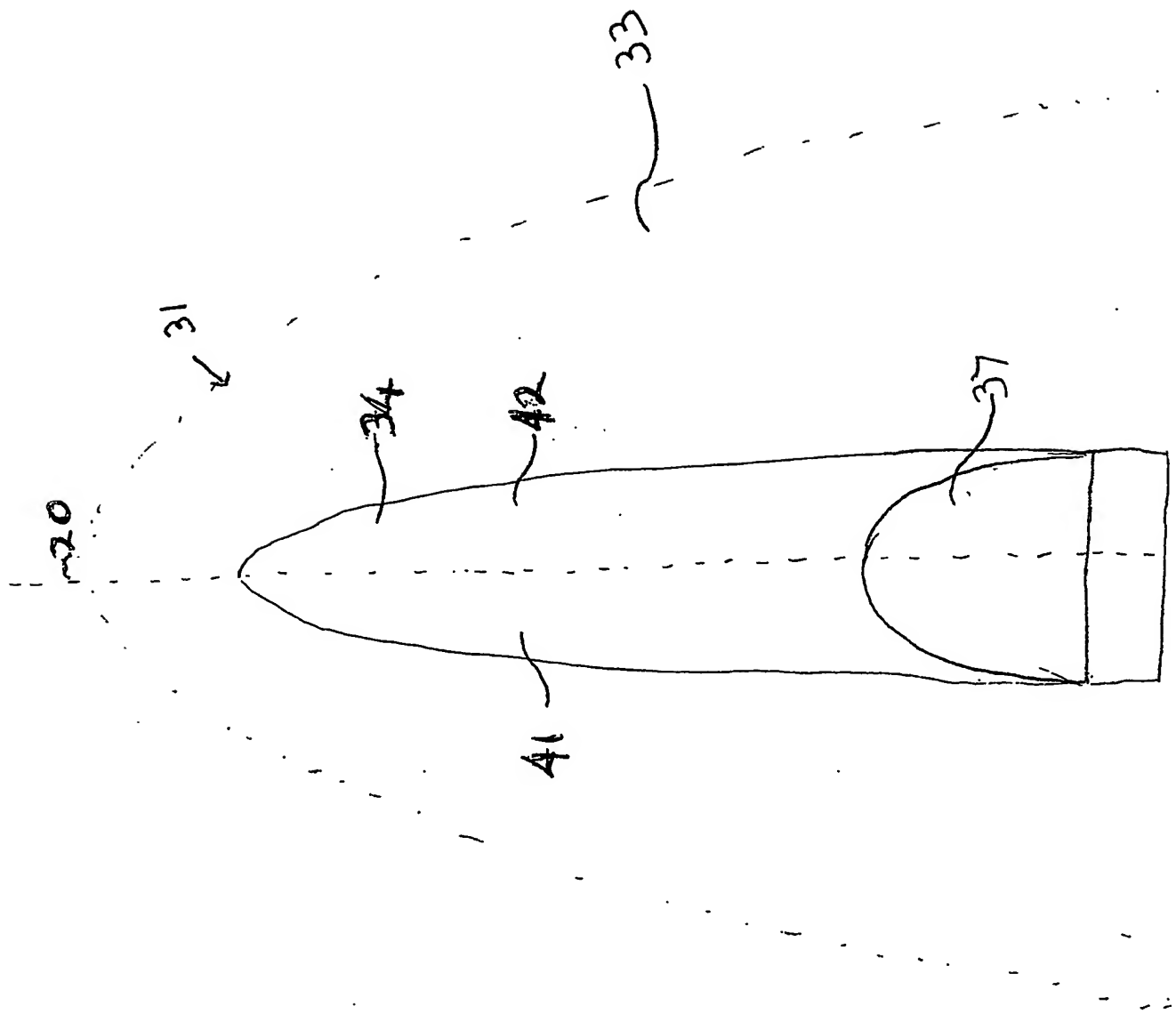
36

37

39

40

33



BEST AVAILABLE COPY

Fig 8

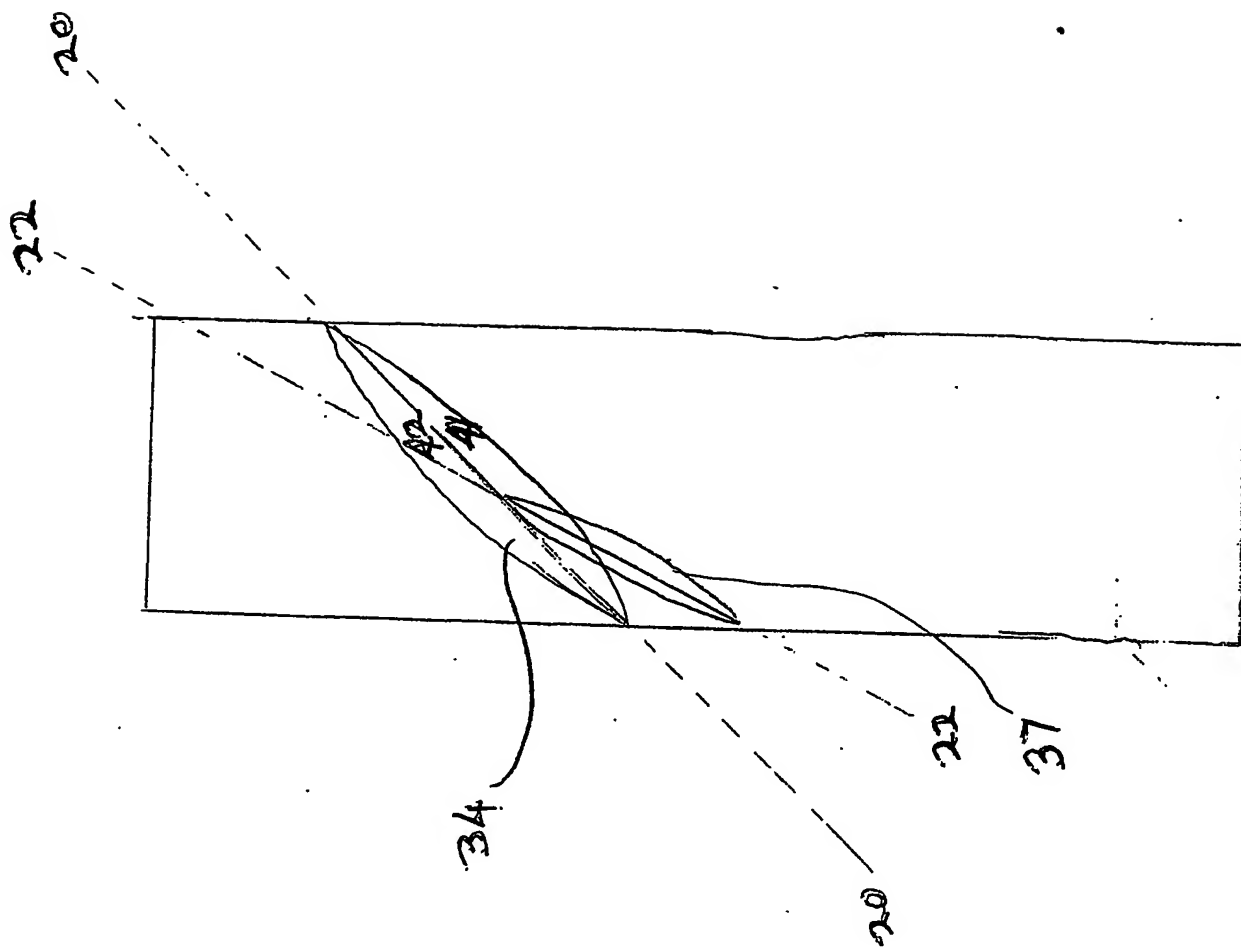


FIG. 9

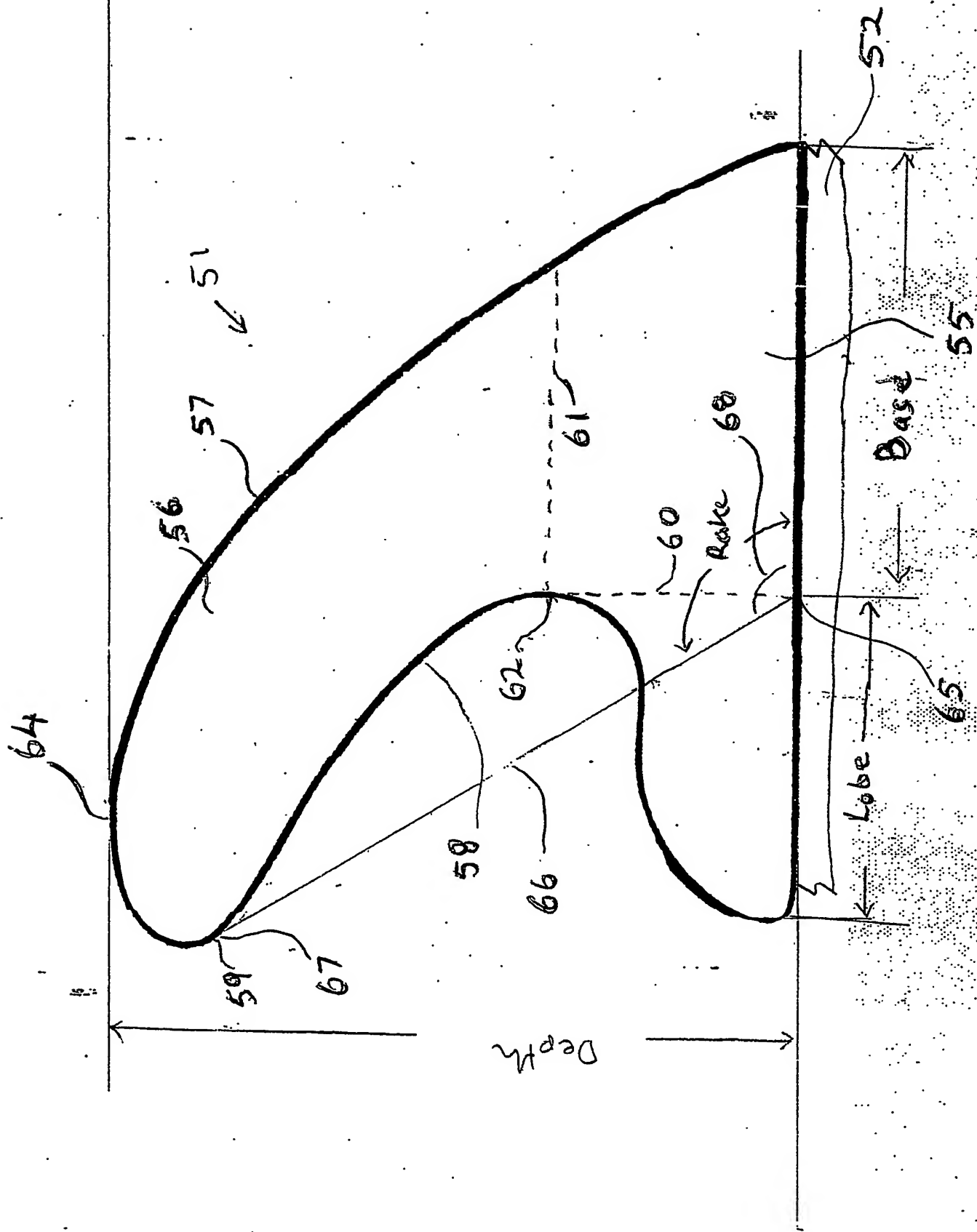


FIG. 10

BEST AVAILABLE COPY